

JYOTIRMĪMĀMSĀ

OF NĪLAKANTHA SOMAYĀJĪ

ED. K. V. SARMA



**V.V.B. INSTITUTE OF SANSKRIT
& INDOLOGICAL STUDIES
PANJAB UNIVERSITY
HOSHIARPUR**

About the work :

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Mean planets having been enunciated by Parameśvara later than Śrīpati, the former will tally (better) with observation. Therefore, in the case of the eclipses enumerated by Parameśvara, those observed by me (Nīlakaṇṭha) and others that might be mentioned hereafter, the Mean Sun etc. shall be computed as directed by Parameśvara. Their True positions shall (however) be computed according to Śrīpati's method. The eclipses should then be computed duly making use of the methods derived from the rationales enunciated by me (in my *Bhāṣya*) on the *Kalakriyā* and *Gola pādas* (of the *Āryabhaṭīya*)" (p. 35).¹ Nīlakaṇṭha then illustrates his instructions by means of a practical example (pp. 35-36). The Precession of the equinoxes which has also a bearing on the results is also touched upon here (pp. 36-37).

9. True Motion, Position, etc. of planets

While continuing the previous computation, the rationale underlying the determination of the true motion of a planet at a particular place at a particular moment is explained in detail. Examples are also worked out for True Sun and Moon to illustrate the rationale of the *Dvitiya-sphuṭa* of planets (pp. 37-41). Another topic treated in a similar manner relates to the correction of the periphery of the Manda epicycle by means of the *natajya* (R Sine zenith distance) (pp. 42-44). Other corrections to be applied to get the True planet such as *ayanacalana* (precession of the equinoxes), *prāṇakalāntara* and *caradala* (half ascensional difference), are also set out in turn with the tables of the Rsines of the latter two and the method of application thereof. (pp. 44-49).

10. Relation of the sides and hypotenuse

After explaining the rationale involved in determining the height of a lamp-post by means of two gnomons (pp. 49-50), Nīlakaṇṭha rationalises from fundamentals the graphical proofs for the relation between the sides and hypotenuse of a right angled triangle—the

1. Cf. : सिद्धान्तशेखराद्युक्तमध्यमेभ्यः परमेश्वरोक्तानां नूतनत्वाद् अस्य दृष्टिसाम्यं स्यात् । तस्मात् सिद्धान्तदीपिकोदाहृतानि अस्माभिः [नीलकण्ठेन] दृष्टानि च तत्तदवसरे वक्ष्यमाणानि परमेश्वरोक्तप्रकारेण अर्कादिमध्यमान्यानीय श्रीपत्युक्तप्रकारेण स्फुटीकृत्य कालक्रिया-गोलपादोक्ताभिः अस्माभिर्व्याख्याताभिः युक्तिभिः सिद्धैः क्रियाविशेषैश्च गण्यन्ताम् । (see below, p. 35).

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periodically to astronomical parameters etc. so that they might give results which would tally with observation. The available manuscript commences with arguments based on eclipses supporting the said thesis, introduced with the words *atha grahaṇam*. It may be presumed reasonably that the author must have, earlier to this, presented similar arguments to the same purpose, based on other visible astronomical phenomena like the setting of the planets, the heliacal rising of the signs, gnomonic shadow etc., with the introductory words, *atha maudhīyam, atha lagnam, atha chaya* etc.

Besides the above, the lost portion should have contained one or more introductory verses through which the author would have uttered the usual invocation to his favourite deity and stated his purpose in composing the work.

2. Missing portions in the middle

Apart from the minor gaps, with which the manuscript abounds and which have mostly been filled tentatively, there occur in the manuscript at least three major omissions which could, obviously, not be filled and, which therefore, mar the continuity of reading. The first of these occurs towards the end (?) of 'Section 14. Astronomical corrections through eclipses' where an illustrative eclipse was being computed (p. 37). The second omission occurs towards the beginning of Section 19, on the 'Height of a lamp-post by means of two gnomons', the close of the previous section also having been lost (p. 49). A portion towards the close of Sn. 20 and beginning of Sn. 21 is also lost.

3. Omission at the end

The extant manuscript breaks off abruptly towards the middle of Section 22, being a discussion on the reduction of the minutes of arc of the visible celestial sphere (*dr̥ggola*) to those of the zodiacal sphere (*bhagola*). There is no possibility of knowing, with exactitude, what more Nīlakaṇṭha had intended to include in the work. The comprehensive title *Jyotirmīmāṃsā* given to the work and of Nīlakaṇṭha's apparent intention (1) to demonstrate that the discipline of *Jyotiṣa* is based on experimentation, and (2) to study the comparative accuracy of the different systems, would induce one to presume that the work contained all that is conveyed by the title and covered by the said intentions. Thus, after completing the topic at hand, viz., *Graha-sphuṭa* (True

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गुरुणां मे पितात्रापि स्थौल्यान्मत्सरिणोदिते ।
 परमेश्वर-तच्छिष्या नैव वेलागतिं विदुः ॥
 इति कौषीतकी श्रुत्वा नेत्रनारायणः प्रभुः ।
 मह्यं न्यवेदयत्, तस्मै तदेवं प्रत्यपादयम् ॥
 (TSS 110, p. 63)

Again, in the long discussion on the calculation of the apparent position of celestial bodies (*ĀBh.*, *Kāla.*, 17-21), speaking on a method to derive the *sakṛt-karṇa*, our author says : अन्यदपि कर्म अस्माभिरुपन्यस्यमानं श्रुत्वा आढ्येन कौषीतकिना अनुष्टुभा निबद्धम्—

स्वोच्चोनमध्यमार्कस्य भुजाज्याघना त्रिजीविका ।
 स्वोच्चहीनस्फुटार्कस्य दोज्याभक्ता श्रुतिर्भवेत् ॥ इति ॥
 (TSS 110, p. 47)

This would indicate the intimacy that existed between Nīlakaṇṭha and his patron and the common interest that bound them together. On the compilation of the *ĀBh. Bhāṣya*, Nīlakaṇṭha observes in one place : यन्मयात्र केषांचित् सूत्राणां तद्युक्तीः प्रतिपाद्य कौषीतकिना आढ्येन नारायणाख्येन व्याख्यानं कारितम्, अतस्तदेवात्र लिख्यते । (TSS 101, p. 113). Again, at another context, he remarks : इतीदं प्रथमे वयस्येव वर्तमानेन मया द्वितीयवयसि स्थितेन कौषीतकिना आढ्येन कारितम् । तस्मिन् स्वर्गते पुनः व्याख्यानमारब्धम् । (TSS 101, p. 156).

It is clear from the above that the credit of enthusing Nīlakaṇṭha in his investigations, and, in fact, to have prompted him to write his *ĀBh. Bhāṣya*, goes to Netraṇārāyaṇa,¹ the members of whose family are known all through the annals of Kerala history to have been good scholars and, at the same time, liberal patrons of scholarship.

1. Even with regard to Nīlakaṇṭha's *Tantrasaṅgraha*, its introductory verse,

हे विष्णो निहितं कृत्स्नं जगत् त्वय्येव कारणे ।
 ज्योतिषां ज्योतिषे तस्मै नमो नारायणाय ते ॥

has a veiled reference to his patron (Netra)-Nārāyaṇa at whose instance that work too seems to have been written.

has set out in his commentary verses, I. 123-79 (pp. 14-19).'' (*op. cit.*, Introduction, p. lxxvii).

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astronomer of the times but also as the author of erudite works on the subject, manuscripts of which are yet to come to light.

Nilakanṭha followed in the footsteps of Parameśvara, founder of the *Dṛggaṇita* system of astronomy in Kerala and one of the foremost astronomers of the land. For him Parameśvara was not only the revered father of his *Guru* but was also his *Parama-guru*, by which term he generally refers to him in his works ; cf., यतो भार्गव-परमेश्वराचार्येण अस्मत्परमगुरुणा 'चलांशास्त्वं (4546) इति कल्यन्दे परीक्ष्य पञ्च-दशांशपूर्तिनिर्णीता । etc. (*Siddhāntadarpaṇa-vyākhyā*, under verse 18, edn. p. 17) ; अस्मत्परमगुरुणापि सिद्धान्तदीपिकायाम् एतत् प्रतिपादितम् । (*ĀBh. Bhāṣya, Golapāda*, verse 3).

8.5. Nilakanṭha's writings

Nilakanṭha has written several works which reflect his deep study of and ripe scholarship in astronomy, embodying the results of his investigations in the subject and interpreting the science lucidly. A mention of his works may, advantageously, be made here :

1. *Golasāra* ('Quintessence of spherical astronomy'), in three *paricchedas*, embodying the basic astronomical elements and procedures.¹

2. *Siddhāntadarpaṇ* ('Mirror of the laws of Astronomy'), a short work in thirty-two *anuṣṭubhs*, enunciating the astronomical constants with reference to the *Kalpa* and specifying his views on the astronomical concepts and topics.²

3. *Candracchāyāgaṇita*, ('Computations concerning the Moon's shadow') or merely *Chāyāgaṇita*, under which title it is sometimes cited, a short work in thirty-two verses on the methods for the calculation of

1. Cr. edn. with Introduction and Translation, by K.V. Sarma, Hoshiarpur, 1970.

2. Critically ed. with the author's own commentary, Translation and Appendices, by K.V. Sarma, Hoshiarpur, 1976, (*Panjab Uni. Indo-logical Series*, No. 7).

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The first five works enumerated above, viz., *Golasāra*, *Siddhānta-darpaṇa*, *Candracchāyāgaṇita*, the commentary thereon, and *Tantrasaṅgraha* do not refer to any other work, but are, in their turn, quoted in other works of Nīlakaṇṭha. Of these, the *Tantrasaṅgraha* is the most comprehensive of the five and gives the date of its composition as 1500 A.D., i.e., it was written when the author was aged fifty-six. On the above considerations it may be presumed that the other four works were written before this date. The *Grahaṇanirṇaya* and the *Sundararāja-praśnottara*, of which manuscripts have yet to be discovered and which are quoted in the *ĀBh. Bhāṣya*, have also to be ascribed to about his period. This *Bhāṣya*, a mature work, Nīlakaṇṭha wrote when he was very old, as he himself remarks : मयाद्य प्रवयसा यथाकथंचिदेव व्याख्यानमारब्धम् । (TSS 101, p. 156). The *Siddhānta-darpaṇa-vyākhyā*, which refers to the *Āryabhaṭīya-Bhāṣya*, (Cf. com. on verse 25 : एतत्सर्वं मया आर्यभटीयव्याख्याने प्रपञ्चितमिति विरम्यते । see p. 24 of the edn.) is still later. And, so is the present work *Jyotirmīmāṃsā* which too refers to the *ĀBh. Bhāṣya* more than once ; cf. तत्र कालक्रियापादे सूचितं मया विवृतम् । (p. 37, below) ; एतत्सर्वं गणितपादे विस्तरेणोपपादितम् । (p. 41, below).

8.7. Date of Nīlakaṇṭha

Indisputable evidences are available for fixing the date of our author. Śaṅkara, Nīlakaṇṭha's pupil, in his commentary on his teacher's *Tantrasaṅgraha*, points out that the first and last verses of that work contain chronograms specifying the dates of the commencement and of the completion of the work. Thus, after giving the literal meaning of the first verse of the work :

‘हे विष्णो निहितं कृत्स्नं’ जगत् त्वय्येव कारणे ।

ज्योतिषां ज्योतिषे तस्मै नमो नारायणाय ते ॥

Śaṅkara says : आचार्येण इमं श्लोकं आदितो ब्रुवता प्रथमपादेन प्रबन्धारम्भदिन-कल्यहर्गणश्च अक्षरसंख्यया उपविष्टः । समाप्तिसमयाहर्गणश्च ‘लक्ष्मीशनिहितध्यान’ इत्यन्ते मविध्यति ।

These two Kali dates, 16,80,548 and 16,80,553, work out to Kali Year 4601, Mīna 26, and 4602, Meṣa 1, both dates occurring in A.D. 1500.

The *Siddhānta-darpaṇa* and Nīlakaṇṭha's own commentary thereon give, respectively, the year and actual date of his birth. Cf. :

Text : कलिसन्ध्यष्टमांशे स्वशतांशादये गते ततः ।

धनुर्मिथुनयोर्मध्ये प्रायशस्त्वपने उभे ॥ (Sid. dar., 18)

Com. : दिव्याब्दशतमिता खलु काले सन्ध्या स्मर्यते । तस्य अष्टमांशः सार्धदिव्याब्दद्वादशकः । स च सौराब्दानां पञ्चचत्वारिंशत्-शतः (4500) । तस्य शतांशः पञ्चचत्वारिंशदब्दः (45) । ततः स्वशतांशादयः 'शिवशिवे'ति (4545). कल्यब्देस्तावति याते उभे अयने उत्तरदक्षिणाख्ये प्रायशो धनुर्मिथुनमध्ये स्तः । तदा अयनचलनांशाः धनात्मकाः पञ्चदशसंख्या बभूवुः । प्रायिकत्वं च कलाष्टकाधिकत्वात् । यतो मार्गव-परमेश्वराचार्येण अस्मत्परमगुरुणा 'चलांशास्त्वं' (4536) इति कल्यब्दे परीक्ष्य पञ्चदशांशपूर्तिनिर्णीता । अतः सन्ध्याष्टमांशशतांशस्य प्रायिकत्वम् । स्वजन्मकालज्ञापनार्थं चैवमुक्तम् । तदा ग्रहर्गणश्च 'त्यजाम्यज्ञतां तर्कैः' (16,60,181) इति । (p. 17 of the edn). Here, Nīlakaṇṭha himself says that he was born on the Kali day 16,60,181, which works out to A.D. 1444.

That Nīlakaṇṭha lived to a ripe old age, even to become a centenarian, is attested by a contemporary reference made of him in a Malayalam work on astrology, viz., the *Praśnasāra* by Mādhava, a Nampūtiri brāhman of the Īñcakkāzhvā house in Kerala, who wrote his work in A. D. 1542-43. Here, Mādhava says that he could count upon reputed authorities like 'Keḷanallūr' to recommend his work. Cf. :

ā|-āyat-ādaravil ādiyil Attimattam
lōkōttaran punar-itinn-ihā 'Keḷanallūr' |
ābhāsar allārivatullaḷavar ādarippān
porum prasiddhi perikoḷḷavar uṇṭanekam //

The date of composition of this work, *Praśnasāra*, is given as Kollam era 718/Kali 4644 (A.D. 1543) by the following verse in the work itself :

ezhunūttorupattettāvatu Kollam atāya nā| |
varunna viṣuvad, bhāvatattvaṁ (4644) kalyabdam āyatu //

Rightly does Nīlakaṇṭha remark in his *ĀBh. Bhāṣya* : मयाद्य प्रवयसा... यथाकथंचिदेव व्याख्यानमारब्धम् (TSS 101, p. 156). Moreover, we know of at least two more works composed by him subsequent to his writing the *ĀBh. Bhāṣya*, viz., the commentary on the *Siddhānta-darpaṇa* and the *Jyōtirmīmāṣā*, both of which quote the *ĀBh. Bhāṣya*.¹

1. The details about Nīlakaṇṭha given above in Section § 8 have been reproduced from the Introduction to the *Tantrasaṅgraha*, pp. xxiv ff., for the sake of the self-sufficiency of the present Introduction.

has set out in his commentary verses, I. 123-79 (pp. 14-19).'' (*op. cit.*, Introduction, p. lxxvii).

After the publication of *Tantrasaṅgraha*, when there was an occasion to re-examine the said fragmentary manuscript in the light of the above-quoted reference in the *Yuktidīpikā* and the context in which that reference has been made, it dawned upon me that, possibly, here, we have a precious literary find—the *Jyotirmīmāṃsā* of Nīlakaṇṭha. The issue was clinched by a two-pronged investigation relating to : (1) the internal evidences on authorship, and (2) the subject-matter of the work.

3. *Authorship of the work*

Though the available manuscript is fragmentary, the contents of the work and the nature of its presentation necessitate the reference, in it, of numerous other works and views. Since Nīlakaṇṭha was a prolific writer who belonged to a lineage of other prolific writers, he refers, in the course of the discussions contained in the present work, to some of his own earlier writings as also to those of his preceptors, often with the name of the source and the authors. These 'signed' references pinpoint the author of the fragmentary work as no other than Nīlakaṇṭha himself.

Thus, while discussing the True motion of planets, the author of the fragment refers to his having quoted, in his (commentary on the) *Kālakriyāpāda*, the verse *candrabāhuphalavarga* etc. of his teacher Dāmodara.¹ Cf :

तत्समा स्फुटगतिः कालक्रियापादे प्रकारान्तरेण 'चन्द्रबाहुफलवर्गे'त्यादिना श्रीमद्-
दामोदराह्वयास्मद्गुरुमुखोद्गतेन श्लोकेनोक्ता । (see below, p. 40).

The full verse occurs quoted in Nīlakaṇṭha Somayāji's *Bhāṣya* on the *Kālakriyāpāda* (of the *Āryabhaṭīya*), 22-25, (edn., *Trivandrum Sanskrit Series*, TSS, No. 110, p.62).

Elsewhere, the author of the fragment justifies the digital value of *muni* as 5, in a certain context, on the authority of his grand-teacher Parameśvara. He says :

2. On Dāmodara and his being the teacher of Nīlakaṇṭha, see below § 8.4.

ROMAN transliteration of Devanagari

VOWELS

Short : अ इ उ ऋ लृ (and ऌ)

a i u ṛ ṛ

Long : आ ई ऊ ए ओ ऐ औ

ā ī ū e o ai au

Anusvāra : ँ = ṁ

Visarga : ः = ḥ

Non-aspirant : ' = ś

CONSONANTS

Classified : क् ख् ग् घ् ङ्

k kh g gh ṅ

च् छ् ज् झ् ञ्

c ch j jh ñ

ट् ठ् ड् ढ् ण्

ṭ ṭh ḍ ḍh ṇ

त् थ् द् ध् न्

t th d dh n

प् फ् ब् भ् म्

p ph b bh m

Un-classed : य् र् ल् व् श् ष् स् ह्

y r l v ś ṣ s h

Compound : क्ष् त्र् ज्ञ्

kṣ tr jñ

has set out in his commentary verses, I. 123-79 (pp. 14-19).'' (*op. cit.*, Introduction, p. lxxvii).

After the publication of *Tantrasaṅgraha*, when there was an occasion to re-examine the said fragmentary manuscript in the light of the above-quoted reference in the *Yuktidīpikā* and the context in which that reference has been made, it dawned upon me that, possibly, here, we have a precious literary find—the *Jyotirmīmāṃsā* of Nīlakaṇṭha. The issue was clinched by a two-pronged investigation relating to : (1) the internal evidences on authorship, and (2) the subject-matter of the work.

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Though the available manuscript is fragmentary, the contents of the work and the nature of its presentation necessitate the reference, in it, of numerous other works and views. Since Nīlakaṇṭha was a prolific writer who belonged to a lineage of other prolific writers, he refers, in the course of the discussions contained in the present work, to some of his own earlier writings as also to those of his preceptors, often with the name of the source and the authors. These 'signed' references pinpoint the author of the fragmentary work as no other than Nīlakaṇṭha himself.

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तत्समा स्फुटगतिः कालक्रियापादे प्रकारान्तरेण 'चन्द्रबाहुफलवर्गे'त्यादिना श्रीमद्-
दामोदराह्वयास्मद्गुरुमुखोद्गतेन श्लोकेनोक्ता । (see below, p. 40).

The full verse occurs quoted in Nīlakaṇṭha Somayāji's *Bhāṣya* on the *Kālakriyāpāda* (of the *Āryabhaṭīya*), 22-25, (edn., *Trivandrum Sanskrit Series*, TSS, No. 110, p.62).

Elsewhere, the author of the fragment justifies the digital value of *muni* as 5, in a certain context, on the authority of his grand-teacher Parameśvara. He says :

2. On Dāmodara and his being the teacher of Nīlakaṇṭha, see below § 8.4.

रविशिष्टलम्बनसंस्कृतं नाडीपञ्चकमेव । तदानीं स्फुटनतिः सम्पत्तिः सकला-
दप्यधिका । अतो ग्रहणमेव न स्यात् ।

‘संभुञ्जीताहिस्तपनम्’ (16,86,847) इत्यस्मिन्नहर्गणे स्पर्शोप-
लब्धा पदच्छाया एकादशसंख्या । मोक्षद्युगतं पुनः पञ्चदशघटिकाः
अष्टांशत्रयसहिताः । तच्च हरिहरादिषु^१ मध्यतमस्कम् । तस्मिन् दिनेऽपि
गोतिकोक्तभगणादिसिद्धचन्द्रादिभिर्गण्यमाने ग्रहणं नैवात्र स्यात् । एव-
मादिदूषणं परैरुद्भाव्यमानं परिहर्तुं परीक्षाप्रकारमाह, यदर्थं पदत्रयेण
सकला युक्तयः प्रदर्शिताः—“क्षितिरवियोगाद् दिनकृद्, रवीन्दुयोगात्” इति
(आर्यभटीयम्, गोलपादः 48) । अत्रोक्ताभिर्युक्तिभिरेव बुद्धिमद्भिः सम्यक्
परीक्षणं शक्यं कर्तुम् ।^२

[२. ग्रन्थकरणे देवताप्रसादः मतिवैमल्यहेतुः, न साक्षादुपदेशः]

ननु तपोभिः प्रसन्नो ब्रह्मा आर्यभटाय भगणपरिध्यादिकं ग्रहगणन-
साधनभूतं संख्याविशेषमुपदिदेश । तदुपदिष्टं पुनरायंभटः सर्वं यथोपदिष्टमेव
दशभिर्गीतिभिः निबबन्ध इति केचिन्मन्यन्ते । तस्य कुतः परीक्षणम्, ब्रह्मणः
सर्वज्ञत्वात्, रागद्वेषाद्यभावाच्च, अवितयत्वनिश्चयात्, इति चेत्—मन्द !
मैवम् । देवताप्रसादो मतिवैमल्यहेतुरेव । न च पुनः ब्रह्मा आदित्यो वा स्वय-
मेवागत्य उपदिशेत् । एवमेव वक्ष्यति चानन्तरसूत्रे—

सदसज्ज्ञानसमुद्रात् समुद्धृतं देवताप्रसादेन ।

सज्ज्ञानोत्तमरत्नं मया निमग्नं स्वमतिनावा ॥

(आर्यभटीयम्, गोलपादः, 49)

इति ।

न पुनः ब्रह्मोपदिष्टं सदसज्ज्ञानसमुद्रनिमग्नम् । न च तत्र सङ्कीर्णता ।
सदसज्ज्ञानयोः असज्ज्ञानमनादाय स्वमतिनावा सज्ज्ञानस्यैव उत्तमरत्नस्यो-
द्धरणमुपपद्यते । तस्माद् ब्रह्मणोपदिष्टमित्येतद् आर्यभटीयवाक्ये नैव विरुद्धम् ।
ग्रन्थकरणासन्नकाले तु प्रतियोगिसद्भावात् तदुच्यमानदूषणासम्भावनार्थं

1. Harihara is in Kārṇāṭaka.

2. Āryabhaṭa's *sūtra* reads in full :

क्षितिरवियोगाद् दिनकृत्, रवीन्दुयोगात् प्रसाधितश्चेन्दुः ।

शशिताराग्रहयोगात् तथैव ताराग्रहाः सर्वे ॥ ४८ ॥

For a 30-page exposition of this verse by our author Nīlakaṇṭha,
see his *Bhāṣya*, ed. in *Trivandrum Sanskrit Series*, No. 185, pp. 128-58.

भाष्ये भास्करः प्रख्यापयति यथा—“काणाद-पाणिनीयानाम् ईश्वरोपदिष्टत्वं प्रख्यापयन्ति । तच्च न वास्तवम् । यथाह भट्टाचार्यः—‘सूत्रकारा न सूत्राणि’ इत्यादिना ‘आप्तेभ्यः कथयन्ति वा’ इत्यन्तेन ग्रन्थेन । तथा च महाभाष्यटीका-याम्—‘मुनिद्वयाद् भाष्यकारस्य प्राधान्यं अधिकलक्ष्यदर्शितत्वात्’ इति । प्रकीर्णकेऽप्याह—‘तेनादृष्टं च भाष्यकृत्’ इति । तेन न पाणिनीयव्याख्या-तारश्च तस्येश्वरोपदिष्टत्वं ऊरीचक्रुः ।”³

[३. भगणादीनां परीक्षणानुमानादिभिर्निर्णयः]³

“ज्योतिष्शास्त्रे [ऽपि युगपरिवृत्तिपरिमाण]⁴द्वारेण चन्द्रादित्यादिगति-विभागेन तिथिनक्षत्रज्ञानमविच्छिन्नसम्प्रदायगणितानुमानमूलम्” इति वास्तिक-कारोऽपि ग्रहगतिज्ञानम् अनुमानेनाह । (तन्त्रवास्तिकम्, on मीमांसासूत्रम् 1.3.2) ।⁴ तत्राविच्छिन्नसम्प्र[दायपदमप्ये]⁵वं व्याचष्टे— “गणितोन्नीतस्य चन्द्रादेः देशविशेषान्वयस्य प्रत्यक्षेण संवादः, ततो निश्चितान्वयस्य परस्य गणित-लिङ्गोपदेशः, ततस्तस्याप्तोपदेशावगतान्वयस्य अनुमानम्, संवादः, परस्मै चोप-देशः इति सम्प्रदायाविच्छेदात् प्रामाण्य[म् ।”] इति । (अजिता-व्याख्या)⁶ ।

1. The passage quoted here is not to be traced in the available manuscripts of Bhāskara's *Bhāṣya* on the *Āryabhaṭīya*, which extend only up to *Gola*. 6. (See Cr. edn. by K.S. Shukla, New Delhi, 1976). Possibly, this passage should have occurred in the com. to *Gola*. 49, which is the verse under reference.

2. This subject is referred to by Śaṅkara in his commentary *Yuktidīpikā* on the *Tantrasaṅgraha* of Nīlakaṇṭha, 1.19-22. Thus, while setting forth the principles and practices involved, Śaṅkara refers to the discussion on the subject in the work *Jyotirmīmāṃsā* by his teacher (Nīlakaṇṭha) :

प्रत्यक्षसिद्धात् सम्बन्धात् कालयुक्त्योरितीदृशात् ।

इयत्ता भगणादीनां युगादिष्वनुमीयते ।

आचार्यैस्तदिदं ज्योतिर्मोमांसायां च दर्शितम् ॥

(Edn., K.V. Sarma, Hoshiarpur, 1977, p. 16)

3. Gap in ms. filled from source.

4. Edn., *Benares Skt. Ser.*, No. 3, 1882-1903, p. 80. For an exposition, see *Nyāyasudhā, Com. on Tantravārttika*, Ch. 55, No. 14, Benares, 1901-9, pp. 129-30.

5. The ms. has a gap for six letters, which is suitably filled up.

6. Paritoṣamiśra's com., available in ms. form.

गणितोन्नीतस्य देशविशेषान्वयस्येति सम्बन्धः । चन्द्रादेर्देशविशेषान्वय एव अनुमीयते । नतु चन्द्रादयः ।

“कृत्तिकाऽस्तस्थितेऽर्केऽद्य चन्द्रदक्षिणपार्श्वगा” ।,

“दिनपेऽस्तस्थिते व्योम्नि तुल्यं चन्द्रेण किञ्चन” ।,

“चन्द्रबिम्बसमं प्रायः परिध्योविवरं तयोः” ।

इत्यादिदेशविशेषान्वयः प्रत्यक्षेण अनुमानेन वा अवगम्यते । तस्मात् शिष्य-
प्रशिष्यपरम्परया सर्वैरपि परीक्षणं कार्यम् । जातकेऽप्याह—

योगे ग्रहाणां, ग्रहणेऽर्कसोमयो-

मौढ्ये, तथा वक्रगतौ च पञ्चसु ।

दृष्टानुरूपं करणं यदन्वहं

तेन ग्रहेन्द्रान् गणयेत् त्रिवारकम् ॥

अन्यश्चाह—

ग्रहणग्रहयोगादौ बहुशो यत् परीक्षितम् ।

करणं तेन संगण्य ज्ञेयाः सूर्यादयो ग्रहाः ॥

पराशरहोरायां निश्चयभागेऽप्युक्तम्—

यदा यश्चैव सिद्धान्ते गणिते दृक्समो भवेत् ।

तदा तेनैव संसाध्यं जातकं गणयेद् ग्रहान् ॥

गोविन्दस्वामी चास्य भाष्ये प्रकटार्थे पराशराभिप्रायमाह¹—“अनेनादावुक्ता दृग्ग-
णिताः सिद्धान्ताः—

स्पष्टो ब्राह्मस्तु सिद्धान्तस्तस्यासन्नश्च रोमशः ।

सौर्यः स्पष्टतरोऽस्पष्टो वासिष्ठः पौलिशश्च तौ ॥

इति । तस्मात् सूर्यसिद्धान्तेन गणनीयमिति पराशरमुनेरभिप्रायः । अस्माकं
त्वार्थभटेनेति—

काले महति देशे वा स्फुटार्थं यस्य दर्शनम् ।

जयत्यार्यभटः सोऽब्धिप्रान्तप्रोल्लङ्घिसद्यशाः ॥

नालमार्यभटादन्ये ज्योतिषां गतिवित्तये ।

तत्र भ्रमन्ति तेऽज्ञानबहुलध्वान्तसागरे ॥

(लघुभास्करीयम्, 1. 2-3)

1. The reference is to Govindasvāmi's com. called *Prakāṣārtha or Sampradāyaprakāśinī*, of which two mss. are available in the Sarasvati Mahal Library, Tanjavoor, (Nos. D. 11498 and D. 11499), and one in the Oriental Res. Inst., Mysore, No. 3166.

has set out in his commentary verses, I. 123-79 (pp. 14-19).'' (*op. cit.*, Introduction, p. lxxvii).

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दिभिः स्वोक्तभूदिनभेदात् जायमानमन्तरं संस्कारेणापि परिहृतम् ।^१ तत्तद्यु-
गादीनाम् अहर्गणस्य प्रतिदिनमवधारणात् नान्यथाकरणं शक्यम् । अब्दगणश्च
अहर्गणार्थं प्रथममेव स्मर्यते, चन्द्रादीनामनवधारणात् । त एव ग्रन्थकारैरन्यथा-
कर्तुं शक्याः । अत आदित्यगतेनिश्चयात् तथैवान्येषां गतिरनुमेया
इति भावः । भगणनानात्वेन विप्रतिपत्तिनिमित्तं संशय एव स्यात्, न निश्चयः ।
तथाप्यनुमानेन निश्चयः स्यात् इति ।

[४. ज्योतिश्शास्त्रस्य शोधनात्मकत्वम्]

मानसव्याख्यातापि कश्चिदाह — “ननु पैतामहादिभेदेन परस्परविरुद्धाश्च
सिद्धान्ता भवन्ति । सिद्धान्तभेदे सति कालभेदः । कालभेदे सति कालाङ्गानि
श्रौतस्मार्तलौकिकानि कर्माणि विकलानि स्युः । कर्मवैकल्ये सति लोकयात्रो-
च्छेदः । हा धिक् ! सङ्कटे महति पतिताः स्मः ।” अत्रोच्यते— ऋजुमते !
स न शोचितव्यः । गुरुचरणपरिचरणपरैः किमिव न ज्ञायते । पञ्चसिद्धान्ता-
स्तावत् क्वचित्काले प्रमाणमेव इत्यवगन्तव्यम् । अपि च यः सिद्धान्तो दर्शना-
विसंवादी भवति सोऽन्वेषणीयः । दर्शनसंवादश्च तदानीन्तनैः परीक्षकैर्ग्रहाणां
विज्ञातव्यः । ये पुनरन्यथा, प्राक्तनसिद्धान्तस्य भेदे सति, यन्त्रैः परीक्ष्य ग्रहाणां
भगणादिसंख्यां ज्ञात्वा अभिनवसिद्धान्तः प्रणेय इत्यर्थात्, तत् त इहलोके-
ऽहसनीयाः, परलोकेऽदण्डनीयाश्च इति ।

गर्गश्चाह—

नक्षत्रसूचकोद्दिष्टमुपवासं करोति यः ।

स याति चान्धतामिहं सार्धंमृक्षविडम्बकैः ॥

(Q. by वराहमिहिरः, बृहत्संहिता, 2. 24)

नक्षत्रसूचकलक्षणं च स एवाह—

अविदित्वैव यः शास्त्रं देवज्ञत्वं प्रपद्यते ।

स पङ्क्तिदूषकः पापः ज्ञेयो नक्षत्रसूचकः ॥

(Q. by वराहमिहिरः, बृहत्संहिता, 2. 23)

देवज्ञस्य पङ्क्तिपावनत्वं च स एवाह—

यस्तु सम्यग् विजानाति होरागणितसंहिताः ।

अग्रभुक् स भवेच्छ्राद्धे पूजितः पङ्क्तिपावनः ॥

(Q. by वराहमिहिरः, बृहत्संहिता, 2. 26)

1. Cf., Brahmagupta, *Br.Sp.S.*, 1.60-61. Several of these *samskāras* have been set out below, see pp. 10-14.

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आर्यभटकालाद्दूर्ध्वं अब्दशतान्तरित एव वराहमिहिरकाल इति गोविन्दपद्धतो होरासम्प्रदायकथनादवगतम्— “सार्धसहस्रत्रये कल्पब्दे भगवत्तोऽभूत् । ततः शताब्दद्वये वराहमिहिरश्च ।” इति तद्वचनादवगम्यते । तस्मात् “शाके नखाब्धिरहिते” इति वचनं न दूषणम् । “उक्तिसौकर्यायैवमुक्तम् ।” इति सूर्यदेवः ।¹

[९. भगणसाम्येऽपि मध्यमभेदे हेतुः]

[i. सूर्यसिद्धान्ते चन्द्रः]

ननु “शशि चयगियिडुशुछ्लृ” (5,77,53,336) (आर्यभटीयम्, गीतिका. 3) इत्युक्तानां [सूर्यसिद्धान्ते]—

5,77,53,336

इन्दो रसाग्नित्रित्रीषुसप्तभूधरमार्गणाः ।

(सूर्यसिद्धान्तः, 1. 30a)

इत्युक्तः । ननु सूर्यसिद्धान्तभगणानां संख्यासाम्यात् कुतो मध्यमभेदः । उच्यते— न च भगणभेद एव मध्यमभेदहेतुः । भूदिनभेदोऽपि मध्यमभेदहेतुः । “कु डिशिबुण्लृखृ प्राक्” (1,58,22,37,500) (आर्यभटीयम्, गीतिका. 3) इत्युक्त-भूभगणेभ्यः ‘ख्युघृ’ (43,20,000) (आर्यभटीयम्, गीतिका. 3, युगरविभगणाः) विशोधने यच्छिष्टं तद् आर्यभटीये औदयिकयुगभूदिनम् । क्षितिरेवियोगो हि सावनदिवसः । रविभगणस्य शून्यचतुष्कादित्वाद् आर्क्षसावनयोः स्थानचतुष्का-दूर्ध्वमेव भेदः ।

1,58,22,37,828

भानामष्टद्विवस्वत्रिद्विद्वचष्टशरेन्दवः ।

(सूर्यसिद्धान्तः, 1. 37a)

इति सूर्यसिद्धान्तोक्ता भोदयाः । अत्र तु ‘डि’ पञ्च शतानि, ‘शि’ सप्त सहस्राणि, ‘बु’ त्रयोविंशत्ययुतानि, ‘ण्लृ’ अर्बुदपञ्चदशकम्, ‘खृ’ अष्टौ कोटयः प्रयुक्ते च द्वे—

1,58,22,37,500

व्योमशून्यशराद्यग्निनेत्राश्चष्टशरेन्दवः ।

1. The reference is to his com. on the *Āryabhaṭīya, Kāla-kriyā*. 10 : “एकमेवात्र न्यूनम् । तथापि उक्तिसौकर्यात् स्वल्पान्तरमिति तथाभिधानं कृतम् ।” (Edn., K.V. Sarma, New Delhi, 1976, p. 94).

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आर्यभटकालाद्दूर्ध्वं अब्दशतान्तरित एव वराहमिहिरकाल इति गोविन्दपद्धतो होरासम्प्रदायकथनादवगतम्— “सार्धसहस्रत्रये कल्पब्दे भगवतोऽभूत् । ततः शताब्दद्वये वराहमिहिरश्च ।” इति तद्वचनादवगम्यते । तस्मात् “शाके नखाब्धिरहिते” इति वचनं न दूषणम् । “उक्तिसौकर्यायैवमुक्तम् ।” इति सूर्यदेवः ।¹

[९. भगणसाम्येऽपि मध्यमभेदे हेतुः]

[i. सूर्यसिद्धान्ते चन्द्रः]

ननु “शशि चयगियिडुशुछ्लृ” (5,77,53,336) (आर्यभटीयम्, गीतिका. 3) इत्युक्तानां [सूर्यसिद्धान्ते]—

5,77,53,336

इन्दो रसाग्नित्रित्रीषुसप्तभूधरमार्गणाः ।

(सूर्यसिद्धान्तः, 1. 30a)

इत्युक्तः । ननु सूर्यसिद्धान्तभगणानां संख्यासाम्यात् कुतो मध्यमभेदः । उच्यते— न च भगणभेद एव मध्यमभेदहेतुः । भूदिनभेदोऽपि मध्यमभेदहेतुः । “कु डिशिबुण्लृखृ प्राक्” (1,58,22,37,500) (आर्यभटीयम्, गीतिका. 3) इत्युक्त-भूभगणेभ्यः ‘ख्युघृ’ (43,20,000) (आर्यभटीयम्, गीतिका. 3, युगरविभगणाः) विशोधने यच्छिष्टं तद् आर्यभटीये औदयिकयुगभूदिनम् । क्षितिरेवियोगो हि सावनदिवसः । रविभगणस्य शून्यचतुष्कादित्वाद् आर्क्षसावनयोः स्थानचतुष्का-दूर्ध्वमेव भेदः ।

1,58,22,37,828

भानामष्टद्विवस्वत्रिद्विद्वचष्टशरेन्दवः ।

(सूर्यसिद्धान्तः, 1. 37a)

इति सूर्यसिद्धान्तोक्ता भोदयाः । अत्र तु ‘डि’ पञ्च शतानि, ‘शि’ सप्त सहस्राणि, ‘बु’ त्रयोविंशत्ययुतानि, ‘ण्लृ’ अर्बुदपञ्चदशकम्, ‘खृ’ अष्टौ कोटयः प्रयुक्ते च द्वे—

1,58,22,37,500

व्योमशून्यशराद्यग्निनेत्राश्चष्टशरेन्दवः ।

1. The reference is to his com. on the *Āryabhaṭīya, Kāla-kriyā*. 10 : “एकमेवात्र न्यूनम् । तथापि उक्तिसौकर्यात् स्वल्पान्तरमिति तथाभिधानं कृतम् ।” (Edn., K.V. Sarma, New Delhi, 1976, p. 94).

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आर्यभटकालाद्दूर्ध्वं अब्दशतान्तरित एव वराहमिहिरकाल इति गोविन्दपद्धतो होरासम्प्रदायकथनादवगतम्— “सार्धसहस्रत्रये कल्पब्दे भगवतोऽभूत् । ततः शताब्दद्वये वराहमिहिरश्च ।” इति तद्वचनादवगम्यते । तस्मात् “शाके नखाब्धिरहिते” इति वचनं न दूषणम् । “उक्तिसौकर्यायैवमुक्तम् ।” इति सूर्यदेवः ।¹

[९. भगणसाम्येऽपि मध्यमभेदे हेतुः]

[i. सूर्यसिद्धान्ते चन्द्रः]

ननु “शशि चयगियिडुशुछ्लृ” (5,77,53,336) (आर्यभटीयम्, गीतिका. 3) इत्युक्तानां [सूर्यसिद्धान्ते]—

5,77,53,336

इन्दो रसाग्नित्रित्रीषुसप्तभूधरमार्गणाः ।

(सूर्यसिद्धान्तः, 1. 30a)

इत्युक्तः । ननु सूर्यसिद्धान्तभगणानां संख्यासाम्यात् कुतो मध्यमभेदः । उच्यते— न च भगणभेद एव मध्यमभेदहेतुः । भूदिनभेदोऽपि मध्यमभेदहेतुः । “कु डिशिबुण्लृखृ प्राक्” (1,58,22,37,500) (आर्यभटीयम्, गीतिका. 3) इत्युक्त-भूभगणेभ्यः ‘ख्युघृ’ (43,20,000) (आर्यभटीयम्, गीतिका. 3, युगरविभगणाः) विशोधने यच्छिष्टं तद् आर्यभटीये औदयिकयुगभूदिनम् । क्षितिरेवियोगो हि सावनदिवसः । रविभगणस्य शून्यचतुष्कादित्वाद् आर्क्षसावनयोः स्थानचतुष्का-दूर्ध्वमेव भेदः ।

1,58,22,37,828

भानामष्टद्विवस्वत्रिद्विद्वचष्टशरेन्दवः ।

(सूर्यसिद्धान्तः, 1. 37a)

इति सूर्यसिद्धान्तोक्ता भोदयाः । अत्र तु ‘डि’ पञ्च शतानि, ‘शि’ सप्त सहस्राणि, ‘बु’ त्रयोविंशत्ययुतानि, ‘ण्लृ’ अर्बुदपञ्चदशकम्, ‘खृ’ अष्टौ कोटयः प्रयुते च द्वे—

1,58,22,37,500

व्योमशून्यशराद्यग्निनेत्राश्चष्टशरेन्दवः ।

1. The reference is to his com. on the *Āryabhaṭīya, Kāla-kriyā*. 10 : “एकमेवात्र न्यूनम् । तथापि उक्तिसौकर्यात् स्वल्पान्तरमिति तथाभिधानं कृतम् ।” (Edn., K.V. Sarma, New Delhi, 1976, p. 94).

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आर्यभटकालाद्दूर्ध्वं अब्दशतान्तरित एव वराहमिहिरकाल इति गोविन्दपद्धतो होरासम्प्रदायकथनादवगतम्— “सार्धसहस्रत्रये कल्पब्दे भगवत्तोऽभूत् । ततः शताब्दद्वये वराहमिहिरश्च ।” इति तद्वचनादवगम्यते । तस्मात् “शाके नखाब्धिरहिते” इति वचनं न दूषणम् । “उक्तिसौकर्यायैवमुक्तम् ।” इति सूर्यदेवः ।¹

[९. भगणसाम्येऽपि मध्यमभेदे हेतुः]

[i. सूर्यसिद्धान्ते चन्द्रः]

ननु “शशि चयगियिडुशुछ्लृ” (5,77,53,336) (आर्यभटीयम्, गीतिका. 3) इत्युक्तानां [सूर्यसिद्धान्ते]—

5,77,53,336

इन्दो रसाग्नित्रित्रीषुसप्तभूधरमार्गणाः ।

(सूर्यसिद्धान्तः, 1. 30a)

इत्युक्तः । ननु सूर्यसिद्धान्तभगणानां संख्यासाम्यात् कुतो मध्यमभेदः । उच्यते— न च भगणभेद एव मध्यमभेदहेतुः । भूदिनभेदोऽपि मध्यमभेदहेतुः । “कु डिशिबुण्लृखृ प्राक्” (1,58,22,37,500) (आर्यभटीयम्, गीतिका. 3) इत्युक्त-भूभगणेभ्यः ‘ख्युघृ’ (43,20,000) (आर्यभटीयम्, गीतिका. 3, युगरविभगणाः) विशोधने यच्छिष्टं तद् आर्यभटीये औदयिकयुगभूदिनम् । क्षितिरेवियोगो हि सावनदिवसः । रविभगणस्य शून्यचतुष्कादित्वाद् आर्क्षसावनयोः स्थानचतुष्का-दूर्ध्वमेव भेदः ।

1,58,22,37,828

भानामष्टद्विवस्वत्रिद्विद्वचष्टशरेन्दवः ।

(सूर्यसिद्धान्तः, 1. 37a)

इति सूर्यसिद्धान्तोक्ता भोदयाः । अत्र तु ‘डि’ पञ्च शतानि, ‘शि’ सप्त सहस्राणि, ‘बु’ त्रयोविंशत्ययुतानि, ‘ण्लृ’ अर्बुदपञ्चदशकम्, ‘खृ’ अष्टौ कोटयः प्रयुक्ते च द्वे—

1,58,22,37,500

व्योमशून्यशराद्यग्निनेत्राश्चष्टशरेन्दवः ।

1. The reference is to his com. on the *Āryabhaṭīya, Kāla-kriyā*. 10 : “एकमेवात्र न्यूनम् । तथापि उक्तिसौकर्यात् स्वल्पान्तरमिति तथाभिधानं कृतम् ।” (Edn., K.V. Sarma, New Delhi, 1976, p. 94).

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परिस्वस्तिके बध्वा अन्यदग्रं पूर्वतोऽपरतो वा दृङ्मण्डलानुसारेण [नीत्वा
दृक्क] ^१र्णदृङ्मण्डलसम्पत्तात् पूर्वतोऽपरतो वा दृङ्मण्डले तावत्येवान्तरे
बध्नीयात् । तस्य स्फुटकर्णोपरिस्वस्तिकान्तरालवर्ती यो भागः स खलु
दृक्कर्णस्य भुजा [तस्मादप्य] ^२ल्पः स्यात्, छायासूत्रस्यैव प्रदेशान्तरे बद्धत्वात्,
तदर्धत्वाच्च तस्य भागस्य । अतः छायासूत्रस्यैव दृक्कर्णस्य भुजा । भूपृष्ठे यस्मिन्
द्रष्टा वर्तते तत्रैव [दक्षिणो] ^३त्तरदिङ्मण्डलोपरिस्वस्तिकं भवति । अतस्तत्र
दृक्कर्णच्छायासूत्रयोः सम्पातोऽपि युक्त एव । छायासूत्रस्य स्फुटकर्णच्छोधिरे
शिष्टं कोटिः स्यात् । सा चाध ^४[] पच्छायासूत्रमध्यघनभूमध्यान्तरालं
शङ्कुरेवेति प्रागेव प्रदर्शितत्वात् ।

ननु भगोललिप्तासमू[हा] ^५त्मकोऽत्र दृक्कर्णः साध्यः । अतस्त-
त्साधनभूतभुजाकोटिग[ता अपि भगोल] ^६लिप्ताभिर्भवितव्यम् । एते पुनः
शङ्कुच्छाये भूगोललिप्तासमूहात्मिके । अतः छायाया भुजात्वमनुपपन्नम् ।
यद्यपि स्फुटकर्णगता लिप्ताः भगोललिप्ताः, तथा शङ्कुगत ... । ^७

1. Four-letter gap in ms., suitably filled.

2. Gap. in ms., tentatively filled.

3. Gap. in ms., suitably filled.

4. Five-letter gap in ms.

5. Gap in ms., suitably filled.

6. Short gap in ms., tentatively filled.

7. The ms. breaks away in the middle of the objection raised by the opponent on the matter of the impropriety of equating the minutes of arc (*kalā*) of the gnouon (*śaṅku*) with those of true hypotenuse (*spṛṣṭa-karṇa*).

has set out in his commentary verses, I. 123-79 (pp. 14-19).'' (*op. cit.*, Introduction, p. lxxvii).

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आर्यभटकालाद्दूर्ध्वं अब्दशतान्तरित एव वराहमिहिरकाल इति गोविन्दपद्धतो होरासम्प्रदायकथनादवगतम्— “सार्धसहस्रत्रये कल्पब्दे भगवतोऽभूत् । ततः शताब्दद्वये वराहमिहिरश्च ।” इति तद्वचनादवगम्यते । तस्मात् “शाके नखाब्धिरहिते” इति वचनं न दूषणम् । “उक्तिसौकर्यायैवमुक्तम् ।” इति सूर्यदेवः ।¹

[९. भगणसाम्येऽपि मध्यमभेदे हेतुः]

[i. सूर्यसिद्धान्ते चन्द्रः]

ननु “शशि चयगियिडुशुछ्लृ” (5,77,53,336) (आर्यभटीयम्, गीतिका. 3) इत्युक्तानां [सूर्यसिद्धान्ते]—

5,77,53,336

इन्दो रसाग्नित्रित्रीषुसप्तभूधरमार्गणाः ।

(सूर्यसिद्धान्तः, 1. 30a)

इत्युक्तः । ननु सूर्यसिद्धान्तभगणानां संख्यासाम्यात् कुतो मध्यमभेदः । उच्यते— न च भगणभेद एव मध्यमभेदहेतुः । भूदिनभेदोऽपि मध्यमभेदहेतुः । “कु डिशिबुण्लृखृ प्राक्” (1,58,22,37,500) (आर्यभटीयम्, गीतिका. 3) इत्युक्त-भूभगणेभ्यः ‘ख्युघृ’ (43,20,000) (आर्यभटीयम्, गीतिका. 3, युगरविभगणाः) विशोधने यच्छिष्टं तद् आर्यभटीये औदयिकयुगभूदिनम् । क्षितिरेवियोगो हि सावनदिवसः । रविभगणस्य शून्यचतुष्कादित्वाद् आर्क्षसावनयोः स्थानचतुष्का-दूर्ध्वमेव भेदः ।

1,58,22,37,828

भानामष्टद्विवस्वत्रिद्विद्वचष्टशरेन्दवः ।

(सूर्यसिद्धान्तः, 1. 37a)

इति सूर्यसिद्धान्तोक्ता भोदयाः । अत्र तु ‘डि’ पञ्च शतानि, ‘शि’ सप्त सहस्राणि, ‘बु’ त्रयोविंशत्ययुतानि, ‘ण्लृ’ अर्बुदपञ्चदशकम्, ‘खृ’ अष्टौ कोटयः प्रयुक्ते च द्वे—

1,58,22,37,500

व्योमशून्यशराद्यग्निनेत्राश्चष्टशरेन्दवः ।

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[९. भगणसाम्येऽपि मध्यमभेदे हेतुः]

[i. सूर्यसिद्धान्ते चन्द्रः]

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5,77,53,336

इन्दो रसाग्नित्रित्रीषुसप्तभूधरमार्गणाः ।

(सूर्यसिद्धान्तः, 1. 30a)

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1,58,22,37,828

भानामष्टद्विवस्वत्रिद्विद्वचष्टशरेन्दवः ।

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1,58,22,37,500

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[९. भगणसाम्येऽपि मध्यमभेदे हेतुः]

[i. सूर्यसिद्धान्ते चन्द्रः]

ननु “शशि चयगियिडुशुछ्लृ” (5,77,53,336) (आर्यभटीयम्, गीतिका. 3) इत्युक्तानां [सूर्यसिद्धान्ते]—

5,77,53,336

इन्दो रसाग्नित्रित्रीषुसप्तभूधरमार्गणाः ।

(सूर्यसिद्धान्तः, 1. 30a)

इत्युक्तः । ननु सूर्यसिद्धान्तभगणानां संख्यासाम्यात् कुतो मध्यमभेदः । उच्यते— न च भगणभेद एव मध्यमभेदहेतुः । भूदिनभेदोऽपि मध्यमभेदहेतुः । “कु डिशिबुण्लृखृ प्राक्” (1,58,22,37,500) (आर्यभटीयम्, गीतिका. 3) इत्युक्त-भूभगणेभ्यः ‘ख्युघृ’ (43,20,000) (आर्यभटीयम्, गीतिका. 3, युगरविभगणाः) विशोधने यच्छिष्टं तद् आर्यभटीये औदयिकयुगभूदिनम् । क्षितिरेवियोगो हि सावनदिवसः । रविभगणस्य शून्यचतुष्कादित्वाद् आर्क्षसावनयोः स्थानचतुष्का-दूर्ध्वमेव भेदः ।

1,58,22,37,828

भानामष्टद्विवस्वत्रिद्विद्वचष्टशरेन्दवः ।

(सूर्यसिद्धान्तः, 1. 37a)

इति सूर्यसिद्धान्तोक्ता भोदयाः । अत्र तु ‘डि’ पञ्च शतानि, ‘शि’ सप्त सहस्राणि, ‘बु’ त्रयोविंशत्ययुतानि, ‘ण्लृ’ अर्बुदपञ्चदशकम्, ‘खृ’ अष्टौ कोटयः प्रयुते च द्वे—

1,58,22,37,500

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[९. भगणसाम्येऽपि मध्यमभेदे हेतुः]

[i. सूर्यसिद्धान्ते चन्द्रः]

ननु “शशि चयगियिडुशुछ्लृ” (5,77,53,336) (आर्यभटीयम्, गीतिका. 3) इत्युक्तानां [सूर्यसिद्धान्ते]—

5,77,53,336

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1,58,22,37,828

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APPENDIX V

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Thus, while discussing the True motion of planets, the author of the fragment refers to his having quoted, in his (commentary on the) *Kālakriyāpāda*, the verse *candrabāhuphalavarga* etc. of his teacher Dāmodara.¹ Cf :

तत्समा स्फुटगतिः कालक्रियापादे प्रकारान्तरेण 'चन्द्रबाहुफलवर्गे'त्यादिना श्रीमद्-
दामोदराह्वयास्मद्गुरुमुखोद्गतेन श्लोकेनोक्ता । (see below, p. 40).

The full verse occurs quoted in Nīlakaṇṭha Somayāji's *Bhāṣya* on the *Kālakriyāpāda* (of the *Āryabhaṭīya*), 22-25, (edn., *Trivandrum Sanskrit Series*, TSS, No. 110, p.62).

Elsewhere, the author of the fragment justifies the digital value of *muni* as 5, in a certain context, on the authority of his grand-teacher Parameśvara. He says :

2. On Dāmodara and his being the teacher of Nīlakaṇṭha, see below § 8.4.

has set out in his commentary verses, I. 123-79 (pp. 14-19).'' (*op. cit.*, Introduction, p. lxxvii).

After the publication of *Tantrasaṅgraha*, when there was an occasion to re-examine the said fragmentary manuscript in the light of the above-quoted reference in the *Yuktidīpikā* and the context in which that reference has been made, it dawned upon me that, possibly, here, we have a precious literary find—the *Jyotirmīmāṃsā* of Nīlakaṇṭha. The issue was clinched by a two-pronged investigation relating to : (1) the internal evidences on authorship, and (2) the subject-matter of the work.

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About the work :

In the *Jyotirmāmāṃsā* ('Investigations on astronomical theories'), its author, Nīlakaṇṭha Somayāji, (A. D. 1444-1545), deals with the experimental and observational aspect of astronomy. He insists that the results arrived at by computation should tally with observation, towards which astronomical parameters and other constants should be revised periodically.

He, therefore, examines critically various corrections put forward by earlier astronomers, compares the results arrived at, gives his reactions and suggests further lines of action. Quite often this is done through simulated discussions with the exponents of other schools of astronomy as in philosophical disquisitions.

In order to ascertain the relative accuracy of the different schools of astronomy, Nīlakaṇṭha instructs the computation of True planets for a particular contemporary date through the different systems and compare the results obtained with the observed positions.

The work is available only in a single decaying palm-leaf manuscript, which is, moreover, incomplete. Still, in view of its unique nature and the highly logical line of approach adopted in it for the discussion of astronomical theories and practices, it is being placed before scholars in its incomplete form. It is to be hoped that, apart from the information it contains, the work will also give an insight into the rational scientific thinking in ancient India and the methodology of astronomical researches in mediaeval Kerala.

प्रधान-सम्पादक:—के. वी. शर्मा

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V. V. R. I. Press and published by
K. V. SARMA, Acting Director, V. V. B.
I. S. & I. S., Panjab University, Hoshiarpur

Price : Rs. 15/-

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